

A Unified Multi-Dimensional Gaskinetic Hybrid BGK-DSMC Method for Nonequilibrium and Chemically Reacting Flows, Phase I

Completed Technology Project (2009 - 2009)



Project Introduction

A consistent and accurate Hybrid gaskinetic BGK and DSMC method, valid in the full Knudsen number (Kn) range, is proposed as a 3D tool to handle hypersonic aerothermodynamics from continuum to thermochemical nonequilibrium and ionized/plasma flows. By domain-decomposition, the proposed method will provide adjoint but automated sub-domain solutions by solving the gaskinetic BGK method of Xu (BGKX) and DSMC in their respective low and high Knudsen regimes, therein the BGKX and DSMC solvers have been proven comparatively efficient for thermo-chemical nonequilibrium flows with accurate heat rate prediction. The proposed approach is considered an advancement in rarefied gasdynamic methodology in that: BGKX is efficient for near continuum flows, say 0



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

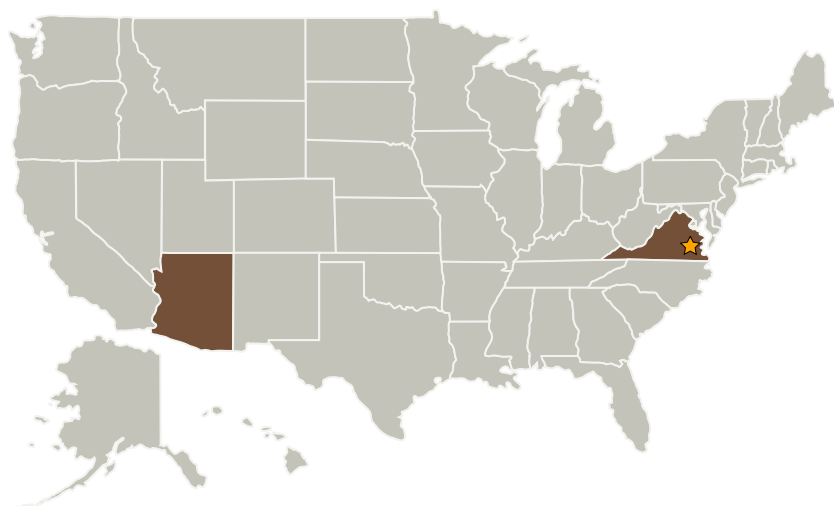
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.2 Aerothermodynamics

Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
ZONA Technology, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona

Primary U.S. Work Locations

Arizona	Virginia
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